

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

Amendment of Part 15 of the Commission's	)	
Rules for Unlicensed White Space Devices	)	ET Docket No. 16-56
	)	RM-11745
	)	

**REPLY COMMENTS OF THE  
NATIONAL ASSOCIATION OF BROADCASTERS**

June 3, 2016

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**I. INTRODUCTION AND SUMMARY**

The National Association of Broadcasters (NAB)<sup>1</sup> hereby replies to comments filed in response to the Commission's Notice of Proposed Rulemaking in the captioned proceeding.<sup>2</sup> The Commission has an unusual opportunity in this proceeding. The limited deployment to date of TVWS technology has provided a window to evaluate the efficacy of the current interference protection regime before these devices have had the opportunity to cause widespread harm. That experience has demonstrated that the current interference protection rules are inadequate. Fortunately, prompt FCC action can address fatal flaws in these rules before the problem becomes unmanageable and unduly burdensome for manufacturers and service providers.

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<sup>1</sup> The National Association of Broadcasters is a nonprofit trade association that advocates on behalf of free local radio and television stations and broadcast networks before Congress, the Federal Communications Commission and other federal agencies, and the courts.

<sup>2</sup> *Amendment of Part 15 of the Commission's Rules for Unlicensed White Space Devices*, Notice of Proposed Rulemaking and Order, ET Docket No. 16-56, RM-11745, FCC 16-23 (Feb. 26, 2016) (Notice).

A number of commenters appear unwilling to acknowledge that the Commission itself has recognized that its current rules regarding the TV White Spaces (TVWS) database are inadequate to protect licensed operations, and must be strengthened. Notwithstanding their reluctance, the Commission has a clear path for updating its rules to reflect real-world experience with the TVWS database. The joint proposal submitted by TVWS device manufacturers and NAB to require automatic geolocation capability will improve the accuracy of the information in the database, protect licensed users from harmful interference and facilitate further deployment of TVWS technology by making TVWS devices more consumer friendly and making installation simpler and less expensive.<sup>3</sup>

NAB does not object to unlicensed operations in the television band, as long as those operations do not pose a risk of harmful interference to licensed operations. Indeed, if the Commission successfully reforms its rules to eliminate the professional installation requirement and require all TVWS devices to incorporate automatic geolocation capability, then NAB would support rule changes permitting TVWS devices to operate at increased power levels and increased height above average terrain, provided interference protection distances are also adjusted appropriately. The critical point is that the FCC must maintain protections for TV viewers – including reforming its rules to prevent intentional or accidental manipulation of the TVWS database. We urge the Commission to move forward with its proposal expeditiously.

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<sup>3</sup> Letter from Haiyun Tang, Adaptrum, Inc., James Carlson, Carlson Wireless Technologies, Inc., Larry W. Koos, Koos Technical Services, Inc., Jordan Du Val, MELD Technology, Inc., and Rick Kaplan, NAB, to Julius P. Knapp, FCC, RM-11745 (July 17, 2015) (Joint Letter).

## II. EXPERIENCE HAS CONFIRMED THE CURRENT RULES ARE INADEQUATE

Some commenters suggest that the Commission's proposal is unnecessary because there have not yet been documented cases of interference by TVWS devices to licensed services.<sup>4</sup> This argument fails for several reasons.

*First*, the contention that TVWS devices have never caused interference to licensed television operations is unverifiable. Prior to 2015, the FCC published quarterly lists of complaint statistics. The most recent of these reports, for the fourth quarter of 2014, shows 125 complaints of interference to broadcast television and radio services.<sup>5</sup> Since that time, the FCC has moved to real-time reporting, which reflects 2,282 complaints regarding television interference since December 29, 2014.<sup>6</sup> Because the FCC typically refers consumers who complain of television interference to the television manufacturer, there is in fact no way to know whether any of these complaints were the result of TVWS device operation. Indeed, in many cases, if they are unable to receive a particular channel, consumers are unlikely to complain about interference, and will simply assume that channel is unavailable at their location.

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<sup>4</sup> Comments of Microsoft Corporation at 2, ET Docket No. 16-56, RM-11745 (May 6, 2016); Comments of Google Inc. at 2, ET Docket No. 16-56, RM-11745 (May 6, 2016).

<sup>5</sup> Summary of Top Six Consumer Informal Complaint Subjects Processed by the FCC's Consumer & Governmental Affairs Bureau, available at <https://transition.fcc.gov/cgb/quarter/complaints-report-Q4-2014.pdf>.

<sup>6</sup> Consumer Complaints by Category in Depth, available at: <https://consumercomplaints.fcc.gov/hc/en-us/articles/204537720-Consumer-Complaints-by-Category-in-Depth->.

Furthermore, Part 15 unlicensed operations in other bands have caused interference and are continuing to cause interference to services provided by TV stations. Part 15 WiFi devices operating in the 5 GHz band have caused interference to weather radar systems used by TV stations. In particular, unlicensed operations have recently caused interference to radar systems used by TV stations in Oklahoma. This poses a potential threat to public safety by endangering stations' ability to track storms during tornado season.

*Second*, while TVWS advocates continue to herald the potential of TVWS technology, that potential is as yet unrealized. There are fewer than 600 TVWS devices operating in the entire country at this point. Claims about whether or not this handful of devices have yet to cause interference must be viewed in the context of a deployment that can most generously be described as nascent.

*Third*, regardless of whether or not there have been documented cases of interference, there have been numerous documented instances of devices being registered in the TVWS database at inaccurate locations – which plainly creates an unacceptable risk of harmful interference. Microsoft asserts that “there has not been a single case of a [TVWS device], other than those in shielded test environments, that has not been properly registered at its true operating location – the only type of data error capable of resulting in harmful interference.”<sup>7</sup> This is flatly untrue. The following are just a small sample of errors NAB has found and previously reported to the FCC:

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<sup>7</sup> Microsoft Comments at 5.

- On April 3, 2015, NAB relayed to the FCC that a TVWS device was improperly registered to a site in the middle of Lake Michigan. This device's operating location was not changed and properly registered until June 1, 2015.<sup>8</sup>
- In May, 2015, NAB contacted Axiom Technologies, a wireless internet service provider in Machias, Maine. NAB explained that Axiom had a device registered to a location in Pennsylvania. Axiom indicated that the device in question was actually being used in Maine and not Pennsylvania. After being made aware of the error, Axiom took 10 days to correct the device's registration data.<sup>9</sup>
- NAB also contacted Conxx.net, a TVWS operator in Cumberland, Maryland and asked whether Conxx.net operated a device operating at a specific location in Pennsylvania. Conxx.net's representatives stated Conxx.net had no device at that location and the location entered was a mistake.<sup>10</sup>
- NAB contacted MyAirFiber, a wireless internet service provider located in Superior, Wisconsin and asked whether MyAirFiber operated a TVWS device in Pennsylvania. MyAirFiber's representative stated that MyAirFiber had no devices operating in Pennsylvania and the registered location in the database was incorrect.<sup>11</sup>
- In early May 2015, NAB contacted Deep South Communications of Laurel, Mississippi and reported that Deep South had two TVWS devices registered to the same exact location near Bear Creek, Montana. Deep South indicated that one location was obviously wrong and they would investigate and fix the location of the device.<sup>12</sup>
- NAB also contacted the designated contact person for a Meld device registered near Ridgeland, Mississippi. The operator indicated that the device was a demonstration unit but did not know why such a device would be registered to an unoccupied location next to a major highway, and agreed this location was clearly in error.<sup>13</sup>
- NAB also pointed out that professional installation failed to properly register devices even for the "TVWS showcase" Air.U project at West Virginia University. Professional installation failed to update registration and provide correct FCC

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<sup>8</sup> Letter from Scott Goodwin to Marlene H. Dortch at 2, Attachment at 5, ET Docket No. 14-165, RM-11745 (June 11, 2015).

<sup>9</sup> *Id.*, Attachment at 6-8.

<sup>10</sup> *Id.*, Attachment at 9.

<sup>11</sup> *Id.*, Attachment at 10-11.

<sup>12</sup> *Id.*, Attachment at 13.

<sup>13</sup> *Id.*, Attachment at 14.

IDs for devices, failed to provide correct serial numbers, failed to provide correct antenna height information and failed to provide any local contact information so that problems could be corrected should they occur.<sup>14</sup>

For all of these reasons, the Commission itself has correctly concluded that, “Under the current rules, we have seen numerous instances where questionable location data have been provided to the databases for fixed white space devices, and this undermines the integrity of the interference protection scheme we adopted.”<sup>15</sup>

NAB has no desire to impose unreasonable or unduly prescriptive mandates. Our joint proposal accommodates existing devices by grandfathering them and providing a reasonable transition period.<sup>16</sup> However, stakeholders in this proceeding should abandon the pretense that the Commission’s existing rules are adequate. Experience has plainly demonstrated they are not; the only question before all parties now is how best to fix these rules.

### **III. THE COMMISSION SHOULD AVOID INTRODUCING NEW POINTS OF FAILURE IN ITS MODIFIED RULES**

NAB agrees with Google that the Commission “should avoid unnecessarily restrictive technical mandates for geolocation” and “should use the capabilities and limits of today’s technology to inform its decision-making process.”<sup>17</sup> NAB also agrees with Google that the rules need not mandate any specific technology for geolocation. While GPS is a simple and economical solution for most fixed devices, the Commission should require only that a TVWS device be capable of determining its location with a certain accuracy without human intervention, either via a built-in capability or physical connection to another device with such

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<sup>14</sup> *Id.*, Attachment at 16-24.

<sup>15</sup> Notice at ¶ 19.

<sup>16</sup> *Id.* at ¶ 10.

<sup>17</sup> Google Comments at 2.



capability.<sup>18</sup> This approach is both technically practical and cost effective to the device manufacturer and end user.

The Commission should not, however, replace the flawed professional installation requirement with new rules that will be subject to the same kinds of manipulation and abuse. For this reason, the Commission should not permit fixed TVWS devices to ascertain their location via a wireless connection. Given the history with the database and documented lack of compliance with the Commission's rules to date, the simplest approach, a secure physical connection, is most appropriate and will ensure that the devices cannot be located at distances greater than allowed by a secure wire connection. While future technological advances may permit other techniques, the simplest and most reliable approach at this time is a physical connection.

Some commenters object to this requirement as unduly burdensome. Microsoft, for example, asserts that such a requirement would increase costs and "would likely be too complex for widespread consumer adoption," because it would "require consumers to not only purchase a separate geolocation device, but also successfully navigate the task of running a cable from that geolocation device to the [TVWS device]."<sup>19</sup> Microsoft apparently envisions an end user installing a device and connecting it by herself, and complains that this will prove too costly and challenging. Setting aside the question of whether connecting two devices with a cable is a particularly daunting task, Microsoft's objection assumes away the FCC's existing rules. While an incorporated or attached geolocation capability may add a few dollars to the

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<sup>18</sup> This built-in capability maybe through a separate

<sup>19</sup> Microsoft Commenrets at 8.

cost of the device, the Commission's current rules force consumers to bear the expense of "professional installation" which has proven unreliable.<sup>20</sup>

Similarly, replacing the existing, ineffective professional installation requirement with a more complex, more expensive and more burdensome professional installation program would be electing to avoid the issue. WISPA continues to claim to be developing a professional installation certification program.<sup>21</sup> Adding certifications or additional training to the professional installation requirement will inevitably increase costs for consumers, while not necessarily improving accuracy. NAB has already demonstrated that well-meaning, trained professionals can and do make significant errors while installing TVWS devices.

Moreover, WISPA is simply mistaken when it claims that the Commission would have authority to take enforcement action against WISPA-certified professional installers. The Commission has jurisdiction to take enforcement action against FCC licensees, manufacturers and operators of RF equipment. Thus, the only enforcement action the Commission could take in the event of continued failure of professional installation would be against the operator of the TVWS device, likely the end-user, or against the manufacturer of the equipment. This is hardly a consumer-friendly approach.<sup>22</sup>

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<sup>20</sup> See Comments of Key Bridge, LLC at 5, GN Docket No. 12-268, ET Docket No. 14-165 (March 9, 2016) ("GPS modules are mature, easy to use, readily available and remarkably cheap; complete electronics kits routinely sell for less than \$10 retail.")

<sup>21</sup> Comments of the Wireless Internet Service Providers Association at 6, ET Docket No. 16-56, RM-11745 (May 6, 2016).

<sup>22</sup> WISPA states that it is working with its own member companies and with the Wireless Innovation Forum to develop a professional installer certification program. *Id.* NAB has also participated in the Wireless Innovation Forum, and has explained to participants that, contrary to WISPA's claims, the only enforcement action permitted under the Communications Act would be against the operator of the TVWS device or the manufacturer of that equipment. This has not been contested even in WINFORUM meetings on this subject.

WISPA also asserts that location accuracy and deployment flexibility can only be optimized by preserving the professional installation requirement. WISPA claims that professional installation is required to correctly ascertain height of a device because vertical errors associated with GPS use can range from 30 feet to several hundred feet, while a human, professional installer will be accurate to within one or two feet.<sup>23</sup> WISPA therefore argues that the Commission should permit professional installers to manually enter device height because such data will provide more accurate information.

NAB's opening comments address the fact that height is generally a less critical factor with respect to preventing interference, and propose specific remedies for inaccurate height information.<sup>24</sup> Moreover, WISPA fails to recognize the demonstrated inaccuracy of professional installation. Currently, every TVWS device must be professionally installed by installers trained and authorized by the TVWS device manufacturer. According to WISPA, then, all current devices should have their height reflected in the database accurately to within one or two feet. Yet, today, 68 TVWS devices, representing well over 10 percent of all TVWS devices, are registered as having antenna heights of one meter or less, with six devices registered with an antenna height of zero meters above ground, which is highly unlikely to be accurate.<sup>25</sup>

WISPA also claims professional installation is needed to identify the EIRP for each channel in use.<sup>26</sup> This problem is readily solved. Just as the database informs TVWS devices

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<sup>23</sup> *Id.* at 4.

<sup>24</sup> NAB Comments at 4-6.

<sup>25</sup> To comply with FCC RF exposure compliance requirements, for fixed TVWS configurations, a separation distance of at least 40 cm (or approximately 16 inches) must be maintained between the antenna of this device and all persons. An antenna installed at 1 meter or less would therefore require signage or fencing to ensure that the required RF safety separation to the public was maintained. This would generally not be the case for an antenna mounted on roof or other structure where access or close proximity to the antenna would be restricted.

<sup>26</sup> WISPA Comments at 4-6.

of available channels, and devices are permitted to operate only on those channels, so too the can the database inform devices of the permitted power on each channel and devices can be built to operate only at the permitted power. Making TVWS operation as automatic as possible is beneficial to users, increases accuracy, promotes innovation and reduces costs. There is simply no need for professional installation and there are no facts supporting the contention professional installation increases database accuracy in any way.

#### **IV. THE COMMISSION SHOULD NOT CREATE EXCEPTIONS FOR LOW POWER DEVICES**

Microsoft and the Wi-Fi Alliance urge the Commission not to mandate automatic geolocation for low power, indoor fixed devices, such as home access points, claiming that the burdens of an automatic geolocation requirement would be out of proportion to the negligible risk of interference.<sup>27</sup> These arguments lack technical merit, and the Commission should not exempt low power fixed devices from the requirement to incorporate an automatic geolocation capability.

The assertion that low power fixed devices create little risk of harmful interference is technically unsupportable. In fact, a 100 mW device could have a signal level as high as -28 dBm at a distance of 16 meters.<sup>28</sup> This is a signal level equivalent to a very strong DTV signal; only four percent of a TV station's coverage area is predicted to have a signal at this level or higher.<sup>29</sup> To avoid co-channel interference to DTV reception, a signal must actually be at least

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<sup>27</sup> Microsoft Comments at 3-4; Comments of Wi-Fi Alliance at 4-6, ET Docket No. 16-56, RM-11745 (May 6, 2016).

<sup>28</sup> This assumes the device transmits at 100 mW around 400 MHz and free space propagation conditions apply over 16 meters – a reasonable assumption in many situations given the short distance of 16 meters.

<sup>29</sup> A strong signal level of -28 dBm and above is predicted to occur in less than four percent of a TV station's coverage area. See, for example, Figure 2-3, *Interference Rejection Thresholds of Consumer*

15dB lower than the desired DTV signal. Thus, a TVWS device operating 16 meters from a TV receiver on the same channel or co-channel to a TV station would be predicted to cause interference throughout a television station's service area.<sup>30</sup> This is not a negligible risk of interference as Microsoft suggests.

Previous TVWS interference testing conducted by the FCC confirms that low power TVWS devices can create severe interference to TV reception over a very substantial area. Section 4 of the FCC's *Evaluation of the Performance of Prototype TV-Band White Space Devices Phase II Report* described WSD transmitter interference tests and demonstrations undertaken by FCC staff.<sup>31</sup> These tests employed a 150mW TVWS device with a transmit antenna at roughly six feet above ground and a typical outdoor DTV receive antenna mounted at 30 feet above ground.<sup>32</sup> FCC staff initially placed the TVWS transmit antenna at a distance of 150 feet from the DTV receive antenna. According to the FCC's report, "Interference was immediately observed in the form of complete loss of the television picture."<sup>33</sup>

FCC staff then repeated the test using a separation distance of 360 meters (1180 feet), the maximum distance that could be practically obtained between the TVWS device and

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*Digital Television Receivers Available in 2005 and 2006*, OET Report FCC/OET 07-TR-1003, Stephen R. Martin, March 30, 2007.

<sup>30</sup> Co-channel interference is avoided with a desired-to-undesired (D/U) signal ratio of about +15 dB. That is, the desired signal must be 15 dB stronger than a co-channel undesired or interfering signal. As shown in the above FCC report, signals at -28 dBm and above are predicted to occur in only four percent of the station's service area closest to the transmit antenna. Typical DTV receivers can provide service down to -83 dBm at the edge of the station's contour.

<sup>31</sup> See *Evaluation of the Performance of Prototype TV-Band White Space Devices Phase II*, OET Report FCC/OET 08-TR-1005, October 14, 2008 (TVWS Report).

<sup>32</sup> Results of this testing would be essentially unchanged with a 100 mW device, which represents less than 2dB difference from the tested 150 mW device.

<sup>33</sup> TVWS Report at 31.

DTV receiver on the FCC laboratory grounds. The result: “Interference was once again observed as a complete loss of picture.<sup>34</sup>” The FCC’s report concludes that “[A] DTV receive system tuned to a weak DTV channel can experience interference at significant separation distances (data extrapolation indicates up to 1.2 km) from the [TVWS] transmitter when it is radiating a signal at ~ 150mW EIRP.”<sup>35</sup>

Indoor operation of a TVWS device does not change these facts, as an indoor TVWS device can be installed near windows or walls with very little building attenuation. Indeed, one of the primary motivations for using white spaces for unlicensed operation is greater coverage and improved building penetration. Further, building attenuation will be at least partially offset because devices will likely be operating at more than six feet above the ground, the height the FCC used in its study, resulting in even greater potential interference distances. In short, a 100 mW TVWS device acting as a home access point and operating co-channel with a distant DTV station will not experience significant degradation or interference from a low level DTV signal, but may cause interference to DTV reception from that station over a significant area.

Furthermore, small fixed devices are, in reality, highly portable. The Commission’s rules already require personal/portable TVWS devices to incorporate automatic geolocation capability. Low power fixed devices, with built-in antennas and a form factor similar to a typical Wi-Fi router, can easily be moved by consumers – for example if a consumer moves to a new city. Requiring a consumer to have a device she has been using “professionally installed” in her new home will impose needless costs – and is likely to result in non-compliance.

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<sup>34</sup> *Id.*

<sup>35</sup> *Id.* at p. 37.

## V. CONCLUSION

NAB remains willing to work with other stakeholders to prevent the potential for harmful interference to licensed users stemming from TVWS operation. However, all parties should be past the point of defending the adequacy of the Commission's current rules. Experience with the professional installation option for determining a device's geographic location has confirmed that professional installation cannot reliably establish the location and other operating parameters of TVWS devices. It cannot serve as the basis for protecting licensed users from harmful interference. This is particularly the case if, as TVWS advocates hope, the FCC's white spaces experiment someday results in widespread adoption of TVWS technology.

Rather than continuing to debate the merits of a failed rule, TVWS advocates should embrace a technological solution put forth by NAB and TVWS device manufacturers themselves – who have far more knowledge concerning their capabilities than any other stakeholder. Requiring TVWS devices to incorporate automatic geolocation capability will reduce consumer installation costs and make TVWS devices more user-friendly. It will better protect licensed users and, if adopted now, while TVWS deployment is still in its prolonged infancy, need not unduly burden TVWS manufacturers. We urge the Commission to move forward in this proceeding expeditiously.

Respectfully submitted,

**NATIONAL ASSOCIATION OF  
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A handwritten signature in black ink, appearing to read "Rick Kaplan", with a long horizontal line extending to the right.

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June 3, 2016



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